

DEPARTMENT OF TRANSPORTATION

DES-OE MS #43
1727 30TH Street, 2ND Floor
Sacramento, CA 95816



**** WARNING ** WARNING ** WARNING ** WARNING ****

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March 25, 2003

04-SF-80-13.4,13.8
04-0120E4
ACBRIM-080-1(094)N

Addendum No. 2

Dear Contractor:

This addendum is being issued to the contract for construction on State highway in THE CITY AND COUNTY OF SAN FRANCISCO AT YERBA BUENA ISLAND.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

Bids for this work will be opened on April 15, 2003.

This addendum is being issued to revise the Project Plans, the Notice to Contractors and Special Provisions, and the Proposal and Contract.

Project Plan Sheets 17, 18, 20, 21, 22, 23, 25, 30, 33, 36, 37, 39, 41, 42, 43, 44, 45, 46, 48, 49, 50, 52, 60, 73, 74, 75, 76 and 77 are revised. Half-sized copies of the revised sheets are attached for substitution for the like-numbered sheets.

Project Plan Sheet 77A is added. A half-sized copy of the added sheet is attached for addition to the project plans.

In the Special Provisions, in the declaration of Registered Professional Engineers (P.E Seal) pages following "IMPORTANT SPECIAL NOTICES," Steve Margaritis Registered Professional Engineer's declaration for Structures is revised as attached.

In the Special Provisions, Section 3, "AWARD AND EXECUTION OF CONTRACT," in the second paragraph, the following two sentences are added after the first sentence:

"The award of the contract, if it be awarded, will be made within 60 days after the opening of the proposals. This period will be subject to extension for such further period as may be agreed upon in writing between the Department and the bidder concerned."

In the Special Provisions, Section 3, "AWARD AND EXECUTION OF CONTRACT," the following paragraph is added after the third paragraph:

"The contract shall be executed by the successful bidder and shall be returned, together with the contract bonds, to the Department so that it is received within **10** days, not including Saturdays, Sundays and legal holidays, after the bidder has received the contract for execution. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816."

In the Special Provisions, Section 5-1.0105, "INTEGRATED SHOP DRAWINGS," is added as attached.

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In the Special Provisions, Section 5-1.14, "MONITORING," the fourth paragraph is revised as follows:

"At the third monthly forum of the contract, the Contractor shall submit a bar chart showing the approximate craft-by-craft schedule of trades to be utilized on the project. Resources outlined in "Progress Schedule (Critical Path Method)" of these special provisions may be utilized to generate and update the bar charts."

In the Special Provisions, Section 5-1.26, "PAYMENTS," in the second paragraph, Item B is revised as follows:

"B. Progress Schedule (Critical Path Method) \$40, 000"

In the Special Provisions, Section 5-1.38, "DAMAGE BY STORM, FLOOD, TSUNAMI OR EARTHQUAKE," is added as attached.

In the Special Provisions, Section 5-1.39, "INDEMNIFICATION," is added as attached.

In the Special Provisions, Section 10-1.08, "PROGRESS SCHEDULE (CRITICAL PATH)," is renamed "PROGRESS SCHEDULE (CRITICAL PATH METHOD)," and revised as attached.

In the Special Provisions, Section 10-1.09, "TIME-RELATED OVERHEAD," the second paragraph is revised as follows:

"Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages", "Force Account Payment", and "Progress Schedule (Critical Path Method)", of these special provisions."

In the Special Provisions, Section 10-1.09, "TIME-RELATED OVERHEAD," the fourteenth paragraph is revised as follows:

"In the event an early completion progress schedule, as defined in "Progress Schedule (Critical Path Method)" of these special provisions, is submitted by the Contractor and approved by the Engineer, the amount of time-related overhead eligible for payment will be based on the total number of working days for the project, in conformance with the provisions in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, rather than the Contractor's early completion progress schedule."

In the Special Provisions, Section 10-1.10, "WORKING DRAWING SUBMITTAL SCHEDULE," is revised as attached.

In the Special Provisions, Section 10-1.23, "PILING," subsection "CAST-IN-DRILLED-HOLE CONCRETE PILES," the following sentence is added after the last sentence of the fourth paragraph:

"Payment for extending the specified tip elevations of the cast-in-drilled-hole concrete piling (rock socket) and cast-in-drilled-hole concrete piling including bar reinforcing, permanent steel casings, and inspection pipes when ordered by the Engineer will be made by extra work as provided in Section 4-1.03, "Extra Work," of the Standard Specifications."

In the Special Provisions, Section 10-1.23, "PILING," subsection "MATERIALS," under "Mineral Slurry," the following paragraph is added after the last paragraph:

"Mineral slurry, if used, shall be replaced with water and the surface of the hole cleaned prior to placing concrete. Water shall conform to the provisions for "Water Slurry," of this section."

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In the Special Provisions, Section 10-1.23, "PILING," subsection "MATERIALS," subsection "Water Slurry" is added as follows:

"Water Slurry

At the option of the Contractor water may be used as slurry.

Water slurry shall be tested for conformance to the requirements shown in the following table:

WATER SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - prior to final cleaning - just prior to placing concrete	1017 *	Mud Weight (Density) API 13B-1 Section 1
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, salt water slurry may be used, and the allowable densities may be increased up to 32 kg/m ³ ."		

In the Special Provisions, Section 10-1.23, "PILING," subsection "STEEL PIPE PILING," in the third paragraph of subsection "Field Welding," the fifth sentence of item "F" is revised as follows:

"Both welds shall be made in the positions to be used in production."

In the Special Provisions, Section 10-1.23, "PILING," subsection "NONDESTRUCTIVE TESTING FOR STEEL PIPE PILING," the subsection "Nondestructive Testing of Welds made at a Fabrication Facility," is revised as follows:

"Nondestructive Testing of Welds made at a Fabrication Facility

Twenty-five percent of each longitudinal and 100 percent of each circumferential weld made shall receive NDT by either radiographic, radiosopic, real time imaging systems or ultrasonic methods that are in conformance with the requirements in AWS D1.1. The acceptance and repair criteria shall conform to the requirements in AWS D1.1, Section 6, for statically loaded structures under tensile stress, except within the "Plastic Hinge Zone" designated on the plans, where the criteria for cyclically loaded nontubular connections subject to tensile stress shall apply. Any required repair, from defects located by NDT, shall be completed and then re-examined by the same NDT method with an additional 10 percent of the weld repair length, not to be less than 50 mm, at each end of the weld repair. In addition, if repairs are required in a portion of a weld not 100 percent examined by NDT, an additional 10 percent of the total length of the weld shall be examined by the same NDT method on each side of the previously inspected length for a total of 20 percent. If the additional NDT and original NDT required discover a cumulative length in weld repairs equal to or greater than 10 percent of the total weld length, than 100 percent of the weld length shall be examined by NDT.

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Twenty-five percent of each pile interior and exterior weld bead shall receive magnetic particle examination in conformance with the requirements in AWS D1.1. The acceptance and repair criteria shall conform to the requirements in AWS D1.1, Section 6, for statically loaded structures under tensile stress, except within the "Plastic Hinge Zone" designated on the plans, where the criteria for cyclically loaded nontubular connections subject to tensile stress shall apply. Any required repairs, from defects located by MT, shall be completed and then re-examined by MT with an additional 10 percent of the weld repair. In addition, if repairs are required in a portion of a weld not 100 percent examined by MT, an additional 10 percent of the total length of the weld shall be examined by MT on each side of the previously inspected length for a total of 20 percent. After the additional NDT is performed, and if more repairs are required, then 100 percent of the weld length shall receive MT."

In the Special Provisions, Section 10-1.25, "CONCRETE STRUCTURES," subsection "LIGHTWEIGHT CONCRETE," the first sentence of the fourth paragraph is revised as follows:

"Lightweight concrete shall have not less than the 56-day compressive strength shown on the plans."

In the Special Provisions, Section 10-1.25, "CONCRETE STRUCTURES," subsection "MASS CONCRETE," under "Demonstration Pours," the first sentence of the first paragraph is revised as follows:

"The Contractor shall cast at least one mock-up each for the column and footing including concrete, reinforcement, and all concrete embedment as shown on the plans to demonstrate adequacy of hydration and thermal properties of concrete predicted by the Thermal Control Plan."

In the Special Provisions, Section 10-1.26, "NONSHRINK GROUT," subsection "DESCRIPTION," the first sentence of the first paragraph is revised as follows:

"This work shall consist of furnishing and placing nonshrink nonexpansive grout for filling the annulus between the cast-in-steel shell concrete piling and the pile sleeves of the steel foundation frames at Pier E2, the permanent steel casing and pile sleeves at Pier 1, and the permanent steel casing and the rock formation at Pier 1."

In the Special Provisions, Section 10-1.26, "NONSHRINK GROUT," subsection "MATERIALS," the fourth paragraph under subsection "Grout," is revised as follows:

"Grout shall have a cube strength at 28 days of at least 75 MPa (75 mm cubes)."

In the Special Provisions, Section 10-1.30, "STEEL STRUCTURES," subsection "FABRICATION," the fourth paragraph under subsection "Tower Anchor Bolts," is revised as follows:

"The Contractor shall furnish and install corrosion protective coverings on tower anchor bolts as shown on the plans. Prior to installing the corrosion protective coverings, the Contractor shall prevent water and other deleterious material from entering the pipe sleeves. Corrosion protective covers shall be on the Department's current prequalified list prior to use."

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In the Special Provisions, Section 10-1.30, "STEEL STRUCTURES," subsection "SHOP WELDING," under subsection "Inspection and Testing," the Notes following the Table are revised as follows:

"Notes:

- 1) If unacceptable discontinuities are found in a joint with 100% NDT, the repairs shall be completed and then re-examined by the same NDT method along with an additional 50 mm at each end of the weld repair, for a minimum total additional length of 100 mm.
- 2) If unacceptable discontinuities are found in a joint with a specified percentage of NDT less than 100 %, including RT examination of butt weld repairs, the repairs shall be completed and then re-examined by the same NDT method along with an additional 50 mm at each end of the weld repair, for a minimum total additional length of 100 mm for the repair re-examination. Two additional previously untested segments, each at least 10% of the total weld length, on each side of the repair, for a total additional length of 20%, shall be tested with the same NDT method. If additional unacceptable discontinuities are found as a result of this testing, then 100% of the remaining untested portion of the weld shall be tested with the same NDT method. All weld repairs shall be tested with the same NDT method that located the original defect.
- 3) Where the specified percentage of testing is greater than 25%, the specified length of each weld shall be tested.
- 4) Where the specified percentage of testing is 25 %, each weld that is 1.5 m long or more shall be examined over 25 % of the weld length. Welds under the same table category in the same component that are less than 1.5 m long may be lot examined by testing one weld 100 % for each lot of four welds.
- 5) Where the specified percentage of testing is 15 %, each weld that is 2.5 m long or more shall be tested over 15 % of the weld length. Welds under the same table category in the same component that are less than 2.5 m long may be lot examined by testing one weld 100 % for each lot of seven welds.
- 6) Where the specified percentage of testing is 10 %, each weld that is 4.0 m long or more shall be examined over 10 % of the weld length. Welds under the same table category in the same component that are less than 4.0 m long may be lot examined by testing one weld 100 % for each lot of ten welds.
- 7) For lot examination, if unacceptable discontinuities are found in the weld tested, the remainder of that weld shall be tested, and a second weld in the lot will be chosen by the Engineer and shall be tested. If unacceptable discontinuities are found in the second weld, the entire lot shall be tested.
- 8) UT examination of PJP welds shall confirm the specified weld size and, for weld sizes greater than 15 mm, shall also evaluate the accessible weld volume to the requirements of AWS D1.5 for welds in compression.
- 9) Welds, and adjacent parent material within 10 mm of all accessible areas surrounding the weld, in grades with strength levels of 485 and above shall be tested 100% by MT in addition to other specified inspection. The timing of visual and any method of NDT for welds in these steels shall be in accordance with AWS D1.5, Section 12.16.4.
- 10) Welds made by either the electroslog or electrogas processes shall be examined 100% by both radiographic and ultrasonic testing.
- 11) Scanning for ultrasonic examination of corner, tee and cruciform welds in thicknesses greater than 50 mm shall include base metal behind and adjacent to the welds. Lamellar tearing discontinuities that exceed 3 mm or that lie within 10 mm of the surface shall be repaired."

In the Special Provisions, Section 10-1.305, "PLASTIC LUMBER," is added as attached.

In the Special Provisions, Section 10-1.31, "CLEAN AND PAINT STRUCTURAL STEEL," subsection "PAYMENT," is deleted.

In the Special Provisions, Section 10-1.35, "ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE PANEL," is added as attached.

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In the Proposal and Contract, in the "PROPOSAL TO THE DEPARTMENT OF TRANSPORTATION," the eleventh paragraph is revised as follows:

"If this proposal shall be accepted and the undersigned shall fail to enter into the contract and furnish the 2 bonds in the sums required by the State Contract Act, with surety satisfactory to the Department of Transportation, within **10** days, not including Saturdays, Sundays and legal holidays, after the bidder has received notice from the Department that the contract has been awarded, the Department of Transportation may, at its option, determine that the bidder has abandoned the contract, and thereupon this proposal and the acceptance thereof shall be null and void and the forfeiture of the security accompanying this proposal shall operate and the same shall be the property of the State of California."

In the Proposal and Contract, the Engineer's Estimate Items 5, 13, 18, 23, 24 and 30 are revised, Items 37, 38 and 39 are added and Item 36 is deleted as attached.

To Proposal and Contract book holders:

Replace the entire Engineer's Estimate in the Proposal with the attached revised Engineer's Estimate. The revised Engineer's Estimate is to be used in the bid.

Indicate receipt of this addendum by filling in the number of this addendum in the space provided on the signature page of the proposal.

Submit bids in the Proposal and Contract book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.

Inform subcontractors and suppliers as necessary.

This office is sending this addendum by UPS overnight mail to Proposal and Contract book holders to ensure that each receives it. A copy of this addendum is available for the contractor's use on the Internet Site:

http://www.dot.ca.gov/hq/esc/oe/weekly_ads/addendum_page.html

If you are not a Proposal and Contract book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,

ORIGINAL SIGNED BY

REBECCA D. HARNAGEL, Chief
Office of Plans, Specifications & Estimates
Office Engineer

Attachments

5-1.0105 INTEGRATED SHOP DRAWINGS

Difficult construction is anticipated at the Tower footing, and the Pier E2 footing and columns that are highly congested with steel plates, stiffeners, studs, dowels, pile sleeves, reinforcing steel, headed reinforcing steel, anchor bolts, pipe sleeves, drain pipe, and other concrete embedded items as shown on the plans. The Contractor shall develop three-dimensional integrated shop drawings (ISD's) for the Tower and Pier E2 including columns and footings, in accordance with the details shown on the plans and the requirements of this section. ISD's shall conform to Section "Working Drawings," of these special provisions. ISD's shall be of sufficient detail to demonstrate compatibility of the embedded items within the concrete.

Embedded items that are to be shown on the ISD's shall include, but are not limited to, the following:

- A. Bar reinforcing steel and splices including lap, welded, and mechanical splices
- B. Casings and pipes
- C. Anchor bolts
- D. Drainage pipe
- E. Corrosion protection system items
- F. Inserts, bolt sleeves, dowels and studs
- G. Other items, as shown on the plans

The Contractor shall use the ISD's to eliminate interference between the planned positions of embedded items and to satisfy the concrete cover shown on the plans. The Contractor shall utilize commercially available software that checks for interference in three dimensions. Prior to acquiring the software, the Contractor shall submit to the Engineer the product name and application features of the software for review and approval. The software shall be compatible with the computer-aided drafting (CAD) software used to develop the ISD's. Bar reinforcement shall be shown with deformed diameters. The Contractor shall develop CAD files using different layers for each type of embedded item such that the sequence of construction of the member or area being detailed can be shown.

If a conflict is identified, the Contractor shall document the conflict and propose changes to the embedded items in the ISD's to resolve the conflict.

The Contractor's proposed changes in the ISD's shall comply with the following sequence of item adjustments:

- A. Non structural embedded items.
- B. Bar reinforcing steel.

If a conflict requires bar reinforcement be adjusted, the Contractor may proceed with performing reinforcing steel adjustments in the ISD's prior to submitting the changes to the Engineer. The Contractor shall consider the following measures in the order prescribed to resolve interference issues during the preparation of the ISD's:

- A. Adjust reinforcement.
- B. Use bundle bars.
- C. Relocate splices.
- D. Change reinforcement size and number. Reduction of the total reinforcement area will not be permitted.
- E. Change reinforcement shape.
- F. Move embedded inserts.

The ISD's to be submitted to the Engineer shall include the following:

- A. Three sets of the ISD's corresponding to the details as shown on the plans without any modifications. These ISD's shall indicate all conflicts including locations of the conflicts and items involved in the conflicts.
- B. Two complete lists of conflicts with descriptions and the Contractor's proposed modifications for each conflict. If more than one measure is possible for resolving the conflict, the Contractor shall document each of the alternative measures.
- C. Three sets of the ISD's corresponding to the details as shown on the plans with incorporation of the Contractor's proposed modifications. These ISD's shall indicate that all previous identified conflicts have been resolved and concrete cover requirements as shown on the plans are met.
- D. ISD's shall be 559 mm x 864 mm in size and shall use colored ink to differentiate each type of embedded items. For each portion of the structure, ISD's shall include a minimum of six isometric views. Any two isometric views shall be 90 degrees apart.
- E. Two copies of the ISD's in electronic form on compact discs or tape for use by the Engineer.

Submittal of isometric drawings made from ISD's shall in no way relieve the Contractor from any other working drawing submittal required by these special provisions or the Standard Specifications.

CAD files of the contract drawings will not be made available to the Contractor.

After complete ISD's are received by the Engineer, the Contractor shall allow the Engineer 20 working days for review and approval. For modifications that are not approved by the Engineer, the Contractor shall propose alternative modifications and resubmit the ISD's as specified in this section. For each revised ISD's submitted by the Contractor, the Contractor shall allow the Engineer an additional 5 working days for review and approval. Assembly of the mock-up represented by the ISD's and construction of the Tower footing and the Pier E2 footings and columns shall not begin until the Engineer reviews and approves the complete ISD's with all conflicts resolved.

No extension of time will be permitted for the Contractor's failure to complete the ISD'S as required by these special provisions.

Full compensation for preparing ISD's, including all revisions necessary due to conflict resolution measures taken by the Contractor, shall be considered as included in the contract prices paid for the various items of work shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

5-1.38 DAMAGE BY STORM, FLOOD, TSUNAMI OR EARTHQUAKE

The first sentence of subparagraph F in Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications, is revised as follows for this contract only:

"Payment for Repair Work -- When the Occurrence that caused the damage was a tsunami, the State will pay the cost of repair determined as provided in Subsection E, that exceeds 5 percent of the amount of the Contractor's bid for bid comparison purposes. When the Occurrence that caused the damage was an earthquake, the State will pay the cost of repair determined as provided in Subsection E, that exceeds the lesser of \$20 million or 5 percent of the amount of the Contractor's bid for bid comparison purposes."

The first sentence of Section 7-1.12B(1)(c), "Liability Limits/Additional Insureds," Subsection (d) of the Standard Specifications, is revised as follows for this contract only:

"\$50,000,000 umbrella or excess liability. Umbrella or excess liability policy shall include products liability completed operations. Further, the umbrella or excess liability coverage shall contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted."

5-1.39 INDEMNIFICATION

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person including, but not limited to, workers and the public or damage to property, and shall indemnify and save harmless T.Y. Lin International / Moffatt & Nichol Engineers, a Joint Venture and its consultants and subconsultants, in the same manner and to the same extent conforming to the provisions in Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications, for the protection of the State of California and all officers and employees thereof connected with the work.

Contractor's liability policies shall be required to name T.Y. Lin International / Moffatt & Nichol Engineers, a Joint Venture, their respective affiliates, parent or affiliated corporations, directors, officers, partners, representatives, employees, consultants, subconsultants and agents, as additional insureds to the extent that the State is named as an additional insured under the Standard Specifications and these Special Provisions with respect to the liability arising from the activities of the Contractor.

Certificates of insurance shall provide thirty (30) days advance written notice of cancellation or nonrenewal and shall clearly specify the Contractor's contract number under which services are provided to the State and the name of the project.

Certificates of insurance and endorsements as required herein shall be provided by Contractor's insurers to the following address:

T.Y. Lin International / Moffatt & Nichol Engineers, A Joint Venture
c/o Dealey, Renton & Associates
P.O. Box 12675
Oakland, CA 94604-2675
Attn: Julie Nelson

10-1.08 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

The Contractor shall submit to the Engineer practicable critical path method (CPM) progress schedules in conformance with these special provisions. Whenever the term "schedule" is used in this section it shall mean CPM progress schedule.

Attention is directed to "Payments" of Section 5 of these special provisions.

The provisions in Section 8-1.04, "Progress Schedule," of the Standard Specifications shall not apply.

DEFINITIONS

The following definitions shall apply to this section:

- A. **ACTIVITY.**—A task, event or other project element on a schedule that contributes to completing the project. Activities have a description, start date, finish date, duration and one or more logic ties.
- B. **BASELINE SCHEDULE.**—The initial schedule representing the Contractor's work plan on the first working day of the project.
- C. **CONTRACT COMPLETION DATE.**—The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer in conformance with the provisions in Section 8-1.06, "Time of Completion," of the Standard Specifications.
- D. **CRITICAL PATH.**—The longest continuous chain of activities for the project that has the least amount of total float of all chains. In general, a delay on the critical path will extend the scheduled completion date.
- E. **CRITICAL PATH METHOD (CPM).**—A network based planning technique using activity durations and the relationships between activities to mathematically calculate a schedule for the entire project.
- F. **DATA DATE.**—The day after the date through which a schedule is current. Everything occurring earlier than the data date is "as-built" and everything on or after the data date is "planned."
- G. **EARLY COMPLETION TIME.**—The difference in time between an early scheduled completion date and the contract completion date.
- H. **FLOAT.**—The difference between the earliest and latest allowable start or finish times for an activity.
- I. **MILESTONE.**—An event activity that has zero duration and is typically used to represent the beginning or end of a certain stage of the project.
- J. **NARRATIVE REPORT.**—A document submitted with each schedule that discusses topics related to project progress and scheduling.
- K. **NEAR CRITICAL PATH.**—A chain of activities with total float exceeding that of the critical path but having no more than 10 working days of total float.
- L. **SCHEDULED COMPLETION DATE.**—The planned project finish date shown on the current accepted schedule.
- M. **STATE OWNED FLOAT ACTIVITY.**—The activity documenting time saved on the critical path by actions of the State. It is the last activity prior to the scheduled completion date.
- N. **TIME IMPACT ANALYSIS.**—A schedule and narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.
- O. **TOTAL FLOAT.**—The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.
- P. **UPDATE SCHEDULE.**—A current schedule developed from the baseline or subsequent schedule through regular monthly review to incorporate as-built progress and any planned changes.

GENERAL REQUIREMENTS

The Contractor shall submit to the Engineer baseline, monthly update and final update schedules, each consistent in all respects with the time and order of work requirements of the contract. The project work shall be executed in the sequence indicated on the current accepted schedule.

Schedules shall show the order in which the Contractor proposes to carry out the work with logical links between time-scaled work activities, and calculations made using the critical path method to determine the controlling operation or operations. The Contractor is responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

The Contractor shall produce schedules using computer software and shall furnish compatible software for the Engineer's exclusive possession and use. The Contractor shall furnish network diagrams, narrative reports, tabular reports and schedule data as parts of each schedule submittal.

Schedules shall include, but not be limited to, activities that show the following that are applicable to the project:

- A. Project characteristics, salient features, or interfaces, including those with outside entities, that could affect time of completion.
- B. Project start date, scheduled completion date and other milestones.
- C. Work performed by the Contractor, subcontractors and suppliers.
- D. Submittal development, delivery, review and approval, including those from the Contractor, subcontractors and suppliers.
- E. Procurement, delivery, installation and testing of materials, plants and equipment.
- F. Testing and settlement periods.
- G. Utility notification and relocation.
- H. Erection and removal of falsework and shoring.
- I. Major traffic stage switches.
- J. Finishing roadway and final cleanup.
- K. State-owned float as the predecessor activity to the scheduled completion date.

Schedules shall have not less than 50 and not more than 500 activities, unless otherwise authorized by the Engineer. The number of activities shall be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts.

Schedule activities shall include the following:

- A. A clear and legible description.
- B. Start and finish dates.
- C. A duration of not less than one working day, except for event activities, and not more than 20 working days, unless otherwise authorized by the Engineer.
- D. At least one predecessor and one successor activity, except for project start and finish milestones.
- E. Required constraints.
- F. Codes for responsibility, stage, work shifts, location and contract pay item numbers.

The Contractor may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time shall be considered a resource for the exclusive use of the Contractor. The Contractor may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently or by completing activities earlier than planned. The Contractor may also submit for approval a cost reduction incentive proposal in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications that will reduce time of construction.

The Contractor may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. The Contractor shall provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule.

State-owned float shall be considered a resource for the exclusive use of the State. The Engineer may accrue State-owned float by the early completion of review of any type of required submittal when it saves time on the critical path. The Contractor shall prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action in conformance with the provisions in "Time Impact Analysis" specified herein. The Engineer will document State-owned float by directing the Contractor to update the State-owned float activity on the next update schedule. The Contractor shall include a log of the action on the State-owned float activity and include a discussion of the action in the narrative report. The Engineer may use State-owned float to mitigate past, present or future State delays by offsetting potential time extensions for contract change orders.

The Engineer may adjust contract working days for ordered changes that affect the scheduled completion date, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications. The Contractor shall prepare a time impact analysis to determine the effect of the change in conformance with the provisions in "Time Impact Analysis" specified herein, and shall include the impacts acceptable to the Engineer in the next update schedule. Changes that do not affect the controlling operation on the critical path will not be considered as the basis for a time adjustment. Changes that do affect the controlling operation on the critical path will be considered by the Engineer in decreasing time or granting an extension of time for completion of the contract. Time extensions will only be granted if the total float is absorbed and the scheduled completion date is delayed one or more working days because of the ordered change.

The Engineer's review and acceptance of schedules shall not waive any contract requirements and shall not relieve the Contractor of any obligation thereunder or responsibility for submitting complete and accurate information. Schedules that are rejected shall be corrected by the Contractor and resubmitted to the Engineer within 5 working days of notification by the Engineer, at which time a new review period of one week will begin.

Errors or omissions on schedules shall not relieve the Contractor from finishing all work within the time limit specified for completion of the contract. If, after a schedule has been accepted by the Engineer, either the Contractor or the Engineer discover that any aspect of the schedule has an error or omission, it shall be corrected by the Contractor on the next update schedule.

COMPUTER SOFTWARE

The Contractor shall submit to the Engineer for approval a description of proposed software before delivery. The software shall be the current version of Primavera SureTrak Project Manager for Windows, or equal, and shall be compatible with Windows NT (version 4.0) operating system. If software other than SureTrak is proposed, it shall be capable of generating files that can be imported into SureTrak.

The Contractor shall furnish schedule software and all original software instruction manuals to the Engineer with submittal of the baseline schedule. The furnished schedule software shall become the property of the State and will not be returned to the Contractor. The State will compensate the Contractor in conformance with the provisions in Section 4-1.03, "Extra Work," of the Standard Specifications for replacement of software which is damaged, lost or stolen after delivery to the Engineer.

The Contractor shall instruct the Engineer in the use of the software and provide software support until the contract is accepted. Within 20 working days of contract approval, the Contractor shall provide a commercial 8-hour training session for 2 Department employees in the use of the software at a location acceptable to the Engineer. It is recommended that the Contractor also send at least 2 employees to the same training session to facilitate development of similar knowledge and skills in the use of the software. If software other than SureTrak is furnished, then the training session shall be a total of 16-hours for each Department employee.

NETWORK DIAGRAMS, REPORTS AND DATA

The Contractor shall include the following for each schedule submittal:

- A. Two sets of originally plotted, time-scaled network diagrams.
- B. Two copies of a narrative report.
- C. Two copies of each of 3 sorts of the CPM software-generated tabular reports.
- D. One 1.44-megabyte 90 mm (3.5 inch) floppy diskette containing the schedule data.

The time-scaled network diagrams shall conform to the following:

- A. Show a continuous flow of information from left to right.
- B. Be based on early start and early finish dates of activities.
- C. Clearly show the primary paths of criticality using graphical presentation.
- D. Be prepared on E-size sheets, 860 mm x 1120 mm (34 inch x 44 inch).
- E. Include a title block and a timeline on each page.

The narrative report shall be organized in the following sequence with all applicable documents included:

- A. Contractor's transmittal letter.
- B. Work completed during the period.
- C. Identification of unusual conditions or restrictions regarding labor, equipment or material; including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours.
- D. Description of the current critical path.
- E. Changes to the critical path and scheduled completion date since the last schedule submittal.
- F. Description of problem areas.
- G. Current and anticipated delays:
 - 1. Cause of delay.
 - 2. Impact of delay on other activities, milestones and completion dates.
 - 3. Corrective action and schedule adjustments to correct the delay.

H. Pending items and status thereof:

1. Permits
2. Change orders
3. Time adjustments
4. Non-compliance notices

I. Reasons for an early or late scheduled completion date in comparison to the contract completion date.

Tabular reports shall be software-generated and provide information for each activity included in the project schedule. Three different reports shall be sorted by (1) activity number, (2) early start and (3) total float. Tabular reports shall be 215 mm x 280 mm (8 1/2 inch x 11 inch) in size and shall include, as a minimum, the following applicable information:

- A. Data date
- B. Activity number and description
- C. Predecessor and successor activity numbers and descriptions
- D. Activity codes
- E. Scheduled, or actual and remaining durations (work days) for each activity
- F. Earliest start (calendar) date
- G. Earliest finish (calendar) date
- H. Actual start (calendar) date
- I. Actual finish (calendar) date
- J. Latest start (calendar) date
- K. Latest finish (calendar) date
- L. Free float (work days)
- M. Total float (work days)
- N. Percentage of activity complete and remaining duration for incomplete activities.
- O. Lags
- P. Required constraints

Schedule submittals will only be considered complete when all documents and data have been provided as described above.

PRE-CONSTRUCTION SCHEDULING CONFERENCE

The Contractor shall schedule and the Engineer will conduct a pre-construction scheduling conference with the Contractor's project manager and construction scheduler within 10 working days of the approval of the contract. At this meeting the Engineer will review the requirements of this section of the special provisions with the Contractor.

The Contractor shall submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and shall be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of these special provisions. If the Contractor proposes deviations to the construction staging of the project, then the general time-scaled logic diagram shall also display the deviations and resulting time impacts. The Contractor shall be prepared to discuss the proposal.

At this meeting, the Contractor shall additionally submit the alphanumeric coding structure and the activity identification system for labeling the work activities. To easily identify relationships, each activity description shall indicate its associated scope or location of work by including such terms as quantity of material, type of work, bridge number, station to station location, side of highway (such as left, right, northbound, southbound), lane number, shoulder, ramp name, ramp line descriptor or mainline.

The Engineer will review the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to the Contractor for implementation.

BASELINE SCHEDULE

Beginning the week following the pre-construction scheduling conference, the Contractor shall meet with the Engineer weekly until the baseline schedule is accepted by the Engineer to discuss schedule development and resolve schedule issues.

The Contractor shall submit to the Engineer a baseline schedule within 20 working days of approval of the contract. The Contractor shall allow 3 weeks for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal will not be considered complete until the computer software is delivered and installed for use in review of the schedule.

The baseline schedule shall include the entire scope of work and how the Contractor plans to complete all work contemplated. The baseline schedule shall show the activities that define the critical path. Multiple critical paths and near-critical paths shall be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities shall be critical or near critical, unless otherwise authorized by the Engineer.

The baseline schedule shall not extend beyond the number of working days specified in these special provisions. The baseline schedule shall have a data date of the first working day of the contract and not include any completed work to date. The baseline schedule shall not attribute negative float or negative lag to any activity.

If the Contractor submits an early completion baseline schedule that shows contract completion in less than 85 percent of the working days specified in these special provisions, the baseline schedule shall be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of on-site construction activities. The Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms shall show labor crafts and equipment classes to be utilized on the contract. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

UPDATE SCHEDULE

The Contractor shall submit an update schedule and meet with the Engineer to review contract progress, on or before the first day of each month, beginning one month after the baseline schedule is accepted. The Contractor shall allow 2 weeks for the Engineer's review after the update schedule and all support data are submitted, except that the review period shall not start until the previous month's required schedule is accepted. Update schedules that are not accepted or rejected within the review period will be considered accepted by the Engineer.

The update schedule shall have a data date of the twenty-first day of the month or other date established by the Engineer. The update schedule shall show the status of work actually completed to date and the work yet to be performed as planned. Actual activity start dates, percent complete and finish dates shall be shown as applicable. Durations for work that has been completed shall be shown on the update schedule as the work actually occurred, including Engineer submittal review and Contractor resubmittal times.

The Contractor may include modifications such as adding or deleting activities or changing activity constraints, durations or logic that do not (1) alter the critical path(s) or near critical path(s) or (2) extend the scheduled completion date compared to that shown on the current accepted schedule. The Contractor shall state in writing the reasons for any changes to planned work. If any proposed changes in planned work will result in (1) or (2) above, then the Contractor shall submit a time impact analysis as described herein.

TIME IMPACT ANALYSIS

The Contractor shall submit a written time impact analysis (TIA) to the Engineer with each request for adjustment of contract time, or when the Contractor or Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The TIA shall illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis shall use the accepted schedule that has a data date closest to and prior to the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event being analyzed. The TIA shall include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules shall be equal to the adjustment of contract time. The Engineer may construct and utilize an appropriate project schedule or other recognized method to determine adjustments in contract time until the Contractor provides the TIA.

The Contractor shall submit a TIA in duplicate within 15 working days of receiving a written request for a TIA from the Engineer. The Contractor shall allow the Engineer 2 weeks after receipt to approve or reject the submitted TIA. All approved TIA schedule changes shall be shown on the next update schedule.

If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will be allowed 15 days from the meeting with the Engineer to give notice in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. The Contractor shall only show actual as-built work, not unapproved changes related to the TIA, in subsequent update schedules. If agreement is reached at a later date, approved TIA schedule changes shall be shown on the next update schedule. The Engineer will withhold remaining payment on the schedule contract item if a TIA is requested by the Engineer and not submitted by the Contractor within 15 working days. The schedule item payment will resume on the next estimate after the requested TIA is submitted. No other contract payment will be retained regarding TIA submittals.

FINAL UPDATE SCHEDULE

The Contractor shall submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. The Contractor shall provide a written certificate with this submittal signed by the Contractor's project manager and an officer of the company stating, "To my knowledge and belief, the enclosed final update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

RETENTION

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during each estimate period in which the Contractor fails to submit an acceptable schedule conforming to the requirements of these special provisions as determined by the Engineer. Schedule retentions will be released for payment on the next monthly estimate for partial payment following the date that acceptable schedules are submitted to the Engineer or as otherwise specified herein. Upon completion of all contract work and submittal of the final update schedule and certification, any remaining retained funds associated with this section, "Progress Schedule (Critical Path Method)", will be released for payment. Retentions held in conformance with this section shall be in addition to other retentions provided for in the contract. No interest will be due the Contractor on retention amounts.

PAYMENT

Progress schedule (critical path method) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path method) shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals, including computer software, and for doing all the work involved in preparing, furnishing, and updating schedules, and instructing and assisting the Engineer in the use of computer software, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for the progress schedule (critical path method) contract item will be made progressively as follows:

- A. A total of 25 percent of the item amount or a total of 25 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon achieving all of the following:
 - 1. Completion of 5 percent of all contract item work.
 - 2. Acceptance of all schedules and TIAs required to the time when 5 percent of all contract item work is complete.
 - 3. Delivery of schedule software to the Engineer.
 - 4. Completion of required schedule software training.
- B. A total of 50 percent of the item amount or a total of 50 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 25 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 25 percent of all contract item work is complete.
- C. A total of 75 percent of the item amount or a total of 75 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 50 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 50 percent of all contract item work is complete.
- D. A total of 100 percent of the item amount or a total of 100 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of all contract item work, acceptance of all schedules and TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If the Contractor fails to complete any of the work or provide any of the schedules required by this section, the Engineer shall make an adjustment in compensation in conformance with the provisions in Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications for the work not performed. Adjustments in compensation for schedules will not be made for any increased or decreased work ordered by the Engineer in furnishing schedules.

10-1.10 WORKING DRAWING SUBMITTAL SCHEDULE

The Contractor shall submit the working drawing submittal schedule in accordance with the requirements of these special provisions.

The Contractor's attention is directed to the section "Progress Schedule (Critical Path Method)" of these special provisions for the definitions of Baseline Schedule and Controlling Operation.

Within 45 days after approval of the contract, the Contractor shall submit to the Engineer for acceptance the working drawing submittal schedule in conjunction with the Baseline Schedule. The working drawing submittal schedule shall include the following:

- A. Name and brief description of all working drawings and supplement including all subsections required by the Standard Specifications and these special provisions.
- B. Reference section of the Standard Specifications or these special provisions for each working drawing submittal.
- C. Allowable time for review of the working drawings by the Engineer as specified in the Standard Specifications and these special provisions.
- D. A time-scaled logic diagram which shows all working drawing submittals, working drawing activities, and demonstrates any interdependency between separate working drawing submittals or partial submittals.
- E. A listing of all working drawing submittals affecting the Controlling/critical path Operation.
- F. Identification of the first occurrence of any Controlling/critical path Operation affected by each working drawing submittal.
- G. A time-scaled diagram showing the estimated number of working drawing submittal sheets to be submitted for the Engineer's review.
- H. In the event that several related working drawing submittals with review times on the controlling/critical path are submitted simultaneously, or an additional working drawing submittal is submitted for review before the review of a previous submittal has been completed, the Contractor shall designate the sequence in which the submittals are to be reviewed.

The Contractor's proposed working drawing submittal schedule shall be in the order of the activities listed in the Baseline Schedule. Working drawing submittal schedules in contradiction with the Baseline Schedule will not be accepted.

Items 'D' through 'H,' above, of the working drawing submittal schedule, shall be updated and submitted to the Engineer on a monthly basis in conjunction with the monthly updates provided for under Progress Schedule (Critical Path Method). The working drawing submittal schedule updates shall reflect actual durations and proposed revisions in durations, resources, and logic.

If working drawing and supplement submittal for any activity is not accepted by the Engineer, the allowable time for review of the working drawings by the Engineer as specified in the Standard Specifications and these special provisions will be reset after a re-submittal is made and the completeness of the re-submittal is checked by the Engineer. No compensation will be allowed for any costs incurred or for delay in completing the work resulting from rejected working drawing submittal. Pursuant to Item 'H,' above, of the working drawing submittal schedule, should the Contractor submit several related working drawing submittals with review times on the controlling/critical path, or an additional working drawing submittal for review before the review of a previously submittal has been completed, the time to be provided for the review of any submittal in the sequence shall be not less than the review time specified for that submittal, plus 7 calendar days for each submittal of higher priority which is still under review.

Full compensation for preparing and submitting the working drawing submittal schedule including all revisions shall be considered as included in the contract lump sum price paid for Progress Schedule (Critical Path Method), and no additional compensation will be allowed therefor. The initial working drawing schedule submittal, as specified herein, shall be considered a component of the Baseline Schedule provisions of Progress Schedule (Critical Path Method), and the monthly working drawing schedule update provisions, as specified herein, shall be considered a component of the provisions of Progress Schedule (Critical Path Method), and the deduction and retention provisions of Progress Schedule (Critical Path Method) shall apply.

10-1.305 PLASTIC LUMBER

This work shall consist of furnishing and installing plastic lumber in conformance with the details shown on the plans and these special provisions.

WORKING DRAWINGS

The Contractor shall submit working drawings for plastic lumber to the Engineer for approval in conformance with the provisions in Working Drawings," of these special provisions.

Working drawings shall show details for component layout and connections, the sequence of shop and field assembly, and installation procedures. Working drawings shall be supplemented with the manufacturer's material test reports, manufacturer's performance data, material safety data sheets, and two copies of the printed literature for the product.

The Engineer will require 4 weeks to review the working drawings after a complete set has been received, as determined by the Engineer. Fabrication of plastic lumber shall not commence until the working drawings are approved. The Engineer will notify the Contractor in writing of approval of the working drawings. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

MATERIALS

General

Plastic lumber shall be produced continuously and homogeneously without joints, shall be straight and true, free of twist, curvature, bulging, or other deformations, and shall have a smooth outer layer with no visible voids.

The cross-sectional dimensions of plastic lumber shall not vary by more than 12 mm nor shall the length vary by more than 25 mm from the dimensions shown on the plans.

Plastic lumber shall have total resistance to marine borers, and dry rot, and shall not swell, shrink, crack, warp, bend or twist.

Plastic lumber shall conform to the physical property requirements listed in the following table:

Property	Test	Requirement
Density, min.	ASTM D 792, Test Method A	Skin: 880 kg/m ³ Core: 680 kg/m ³
Water Absorption, max.	ASTM D 570 (maximum weight increase)	1.0% at 2 hrs. 3.0% at 24 hrs.
Brittleness	ASTM D 746	Skin: No break at -40°C
Hardness	ASTM D 2240 Shore D	Skin: 45-75
Ultraviolet Deterioration	ASTM D 4329 (See Note 1) ASTM D 2240 Shore D	Skin: After 500 hrs. of exposure, hardness shall not have changed by more than 10%
Abrasion	ASTM D 4060 Cycles: 10,000 Wheel: CS17 Load : 1 kg	Skin: Mass Loss: < 0.5 g Wear Index: 2.5-3.0
Chemical Resistance	ASTM D 543 Practice A, Procedure 1	Sea water < 1.5% mass increase Gasoline < 7.5% mass increase No. 2 Diesel < 6.0% mass increase
Coefficient of Thermal Expansion, max.	ASTM D 696	0.00009 mm/mm/°C
Ignition Temperature	ASTM D 1929	> 343°C

Note 1: ASTM D 4329 using UVB 340 bulbs operating at a UV intensity of 0.77 W/m²/nm measured at 340 nm. The exposure cycle shall be 4 hours of ultraviolet (UV) exposure at 60°C and 4 hours of condensate (CON) exposure at 40°C.

Each piece of plastic lumber shall be permanently marked with the manufacturer's name.

Plastic lumber shall be shipped and stored in a manner that will minimize scratching or damage to the outer surfaces.

A Certificate of Compliance for each shipment of plastic lumber used on the project shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall be accompanied by a laboratory test report certifying that the material conforms to the requirements specified herein.

Reinforced Recycled (RR) Plastic Lumber

RR plastic lumber shall consist of recycled plastic reinforced with fiberglass reinforcing bar elements, fiberglass filaments, or a combination of fiberglass reinforcing bar elements and fiberglass filaments.

RR plastic lumber shall conform to the requirements of a recycled product. A recycled product is defined as a material, good, or supply, of which no less than 50 percent of its total mass consists of secondary waste, and no less than 10 percent of its total mass consists of post-consumer waste. Post-consumer waste is defined as a finished material, which would have been disposed of as a solid waste, having completed its life cycle as a consumer item, and does not include manufacturing waste. Secondary waste is defined as either fragments of finished products or finished products of a manufacturing process, and includes post-consumer waste. Secondary waste does not include excess virgin resources of the manufacturing process.

RR plastic lumber shall be fabricated from a mixture of one or more of the following thermoplastics: high-density polyethylene, medium-density polyethylene, low-density polyethylene, or high-density polypropylene. RR plastic lumber shall consist of a dense outer skin, not less than 4.8 mm thick, surrounding a less dense core. The plastic for the outer skin shall be mixed with the appropriate colorants to produce a black or dark brown color, and shall contain an ultraviolet inhibitor and antioxidants.

Fiberglass reinforcing bar elements for RR plastic lumber shall conform to the following requirements:

Property	ASTM Designation	Requirement
Flexural Strength, min.	D 790	483 MPa
Compression Modulus, min.	D 695	276 MPa
Tensile Strength, min.	D 638	483 MPa

Fiberglass filaments for RR plastic lumber shall conform to the following requirements:

Property	ASTM Designation	Requirement
Density	D 693	2.57-2.60 gm/cm ³
Mechanical-Single Filament Tensile Strength	D 2101	3450-3790 MPa
Tensile Modulus of Elasticity	D 2101	69-72 MPa

RR plastic lumber reinforced with different types of reinforcing elements shall not be mixed on one contract, unless otherwise shown on the plans.

Composite Plastic (CP) Lumber

At the Contractor's option, CP lumber may be substituted for RR plastic lumber. CP lumber shall conform to the requirements specified herein.

The shell for CP lumber shall be produced from polyester or epoxy resin reinforced with E-Glass and shall be mixed with colorants, ultraviolet inhibitors, and antioxidants.

The core material for CP lumber shall be lightweight aggregate polymer concrete.

CP lumber shall conform to the physical property requirements for RR plastic lumber and the following:

Property	Test	Requirement
Density of concrete core, min.	ASTM D 792	1760 kg/m ³
28-day compressive strength of concrete core, min.	ASTM D 579	34.5 MPa
Structural Strength of shell		Less than 10% loss after UV deterioration test specified for plastic lumber
Tensile strength, tensile modulus	ASTM D 638	
Flexural strength, flexural modulus	ASTM D 790	

Cut ends of CP lumber shall be sealed with a cap securely held in place with an adhesive recommended by the manufacturer. The adhesive shall show no more than a 10 percent decrease in strength when tested in conformance with the requirements in ASTM Designation: D 3164 following two cycles of exposure in conformance with the requirements in ASTM Designation: D 1183, Procedure D. The procedure shall be modified so that the low temperature phase of the procedure shall be at $-20^{\circ}\text{C} + 3^{\circ}\text{C}$, and the high temperature phase shall be at $60^{\circ}\text{C} + 3^{\circ}\text{C}$.

CP lumber shall be coated with a black (Federal Standard 595B No. 37030) or dark brown (Federal Standard 595B No. 30097) coating to a minimum dry film thickness of 380 μm . No visible color change in the coating shall occur when tested in conformance with the requirements in ASTM Designation: D 4329 using UVB 340 bulbs operating at an ultraviolet (UV) intensity of 0.77 W/m^2 measured at 340 nm for 800 hours of exposure. The exposure cycle shall be 4 hours of UV exposure at 60°C and 4 hours of condensate (CON) exposure at 40°C . The coating shall have a minimum initial adhesion value of 1.03 MPa when tested in conformance with the requirements in ASTM Designation: D 4541. The coating shall show no more than a 10 percent decrease in its initial adhesion strength following two exposure cycles in conformance with the requirements in ASTM Designation: D 1183, Procedure D as modified above.

Unreinforced Recycled (URR) Plastic Lumber

At the Contractor's option, URR plastic lumber may be substituted for RR plastic lumber for chocks and filler blocks, and other nonstructural members shown on the plans or approved by the Engineer. URR plastic lumber shall conform to the requirements specified herein for RR plastic lumber except fiberglass reinforcement will not be required, and stiffness tests shall not apply.

Hardware

Hardware shall consist of bolts and rods with necessary nuts and washers, lag screws, and other metal fasteners shown on the plans.

All hardware shall be stainless steel anchor devices as shown on the plans. All coupling, bolts and lag bolts, shall be ASTM A 276, Type 316 stainless steel.

TESTING

Stiffness Test Requirements

Prior to shipment to the jobsite, stiffness tests shall be performed for plastic lumber, in the presence of the Engineer, at an independent testing laboratory, and at the Contractor's expense, unless otherwise directed in writing. The Contractor shall notify the Engineer in writing prior to conducting the stiffness tests.

Two samples from each production lot will be randomly selected by the Engineer for stiffness tests.

A production lot of plastic lumber is defined as a quantity of 100 cubic meters, or fraction thereof, of plastic lumber, which is ready for shipment to the jobsite, of the same type, manufactured by the same method, and made of the same material. A new production lot shall be started if any production parameter changes before the maximum production lot size is reached.

The Engineer will be at the independent testing laboratory within a maximum of 10 working days after receiving writing notification. In the event the Engineer fails to be present at the testing site within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's failure to be present, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Stiffness tests shall conform to the requirements in ASTM Designation: D 790, except that the samples shall have a minimum length of 4 meters and the tests shall be performed on a 3.66-meter span length at a crosshead motion of 7 mm/min. The stiffness shall be calculated using the secant modulus at the flexural strain of 0.010 mm/mm and shall meet the minimum values specified in the following table:

Cross Section Size (mm)	Stiffness EI ($\text{kN}\cdot\text{m}^2$)	Yield Stress in Bending (MPa)
203x254	385	32
203x305	364	26
254x254	729	27
254x305	756	25
305x305	1195	21

These values are for the weak axis of rectangular sections.

If one sample fails to conform to the requirements specified herein, a retest shall be performed on an additional 2 samples selected by the Engineer. If either sample in the retest fails to conform to the specified requirements, the entire production lot of plastic lumber represented by the samples will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

Void Test Requirements

Prior to use in the work, 2 samples of each size from each lot of plastic lumber delivered to the jobsite, or a quantity of 100 cubic meters, or fraction thereof, of said plastic lumber, whichever is smaller, will be selected by the Engineer for void tests.

The samples will be examined by the Engineer for exterior voids first. The exterior voids shall conform to the following requirements:

- ◆ The maximum dimension of any void at each exposed end shall not exceed 25 mm.
- ◆ The total number of voids with a maximum dimension greater than 6 mm at each exposed end shall not exceed 4.

If a sample examined for exterior voids fails to conform to either requirement above, a retest shall be performed on an additional 2 samples selected by the Engineer. If either sample in the retest fails to conform to either requirement, the entire lot of plastic lumber represented by the samples will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

After passing the requirements above, the samples are to be cut into 305-mm long segments by the Contractor and examined for interior voids by the Engineer. The cut sections of each segment shall conform to the following requirements:

- The maximum dimension of any void in a cut section shall not exceed 12 mm.
- The total area of voids in a cut section shall not exceed 5 percent of the total cross-sectional area.

If a cut section examined for interior voids fails to conform to either requirement above, a retest shall be performed on an additional 2 samples selected by the Engineer. If a cut section in the retest fails to conform to either requirement, the entire lot of plastic lumber represented by the samples will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

Test results will be reported in writing to the Contractor within 10 working days after receipt of the samples by the Engineer. In the event the Engineer fails to provide the test results within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in providing the results, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All samples for stiffness and void tests shall be furnished by the Contractor at the Contractor's expense.

CONSTRUCTION

Plastic lumber shall be installed in conformance with the manufacturer's recommendations and these special provisions.

Plastic lumber shall be stacked on dunnage above ground so that it may be readily inspected and shall be stored and handled in a manner that will avoid damage, breakage, or other deformations. The lumber shall be protected from the sun to prevent warping.

Plastic lumber shall be cut, beveled, drilled, counterbored, and otherwise fabricated in conformance with the manufacturer's recommendations, and as shown on the plans. Fabrication shall be done in the manufacturer's facilities to the greatest extent possible.

Unless otherwise shown on the plans, holes for bolts in the plastic lumber shall be bored 3 mm larger in diameter than the bolt to be placed. Holes for lag screws shall be bored to a diameter in conformance with the manufacturer's recommendations. Bolts and lag screw heads shall be recessed 12 mm from the surface of the face of the plastic lumber fender or as shown on the plans.

Holes drilled through CP lumber members shall be coated with a concrete sealant conforming to the manufacturer's recommendations.

Plastic lumber elements that are split, broken, warped, or otherwise damaged will be rejected and replaced at the Contractor's expense.

MEASUREMENT AND PAYMENT

Plastic lumber will be measured by the cubic meter. The quantity to be paid for shall be determined from nominal widths and thicknesses and the actual lengths of the pieces in the finished assembly as shown on the plans.

The contract price paid per cubic meter for plastic lumber shall include full compensation for furnishing all labor, materials (including hardware), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing plastic lumber, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.35 ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE PANEL

Ultra High Molecular Weight (UHMW) polyethylene panel shall consist of furnishing and installing UHMW panels and shall conform to the details shown on the plans and these special provisions.

MATERIALS

The UHMW panels shall be manufactured with a maximum 50 percent regenerated or recycled material; and with a molecular weight of 3,000,000 to 6,000,000 in accordance with ASTM Designation: D 4020, compression molded, stress relieved, and including an ultraviolet stabilizer. The color of the panels shall be black. The UHMW shall be approved by the Engineer. Physical characteristics shall conform to the following requirements:

- A. Static coefficient of friction to steel (dry) shall be less than 0.025.
- B. Specific gravity shall be greater than 0.92 (ASTM Designation: D 792)
- C. No water absorption shall be shown under long term immersion (ASTM Designation: D 510)
- D. The minimum tensile stress capacity shall be 25 MPa and the minimum impact shear capacity shall be 10 MPa.

The UHMW panels shall be anchored to the in-place, plastic lumber fender walers using stainless steel anchor devices as shown on the plans. All couplings, bolts, and lag bolts shall be ASTM Designation: A 276, Type 316 stainless steel.

CONSTRUCTION

The UHMW panels shall be delivered to the site and stored in a manner that will prevent damage to the panels. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, shall be furnished for each shipment of UHMW panels certifying that the material and workmanship conforms to the requirements in ASTM Designation: D 4020 and these special provisions. Two copies of the certifications from the manufacturer shall be furnished to the Engineer. Materials without manufacturer's certification will be rejected.

Immediately prior to installation, the Contractor shall inspect the panels for damage and the results of the inspection shall be reported to the Engineer. Materials which, in the Engineer's opinion, are defective or damaged, shall be repaired or replaced in kind by the Contractor at the Contractor's expense.

All lag screw heads shall be countersunk flush with the surface of the UHMW panels. All lag screw locations shall be pre-drilled into the receiving plastic lumber walers with bits having the same diameter as the bolt shank.

The minimum clear distance from the heads of all lag screws to the end or edge of the plastic lumber walers shall be 50 mm. The minimum edge distance from the centerline of lag screws to the edge of a UHMW panel shall be 50 mm.

UHMW panels shall be installed abutting each other with a 6.5 mm gap between two panels and all joints between panels shall be flush.

UHMW panels at all corners shall be constructed of a single unit formed by heat bending in accordance with the manufacturer's recommendations. Butt joints at corner locations will not be permitted.

MEASUREMENT AND PAYMENT

UHMW polyethylene panels will be measured by the square meter.

The contract price paid per square meter for UHMW polyethylene panel (50 mm) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in constructing UHMW polyethylene panel, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

ENGINEER'S ESTIMATE
04-0120E4

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	030627	ELECTRONIC MOBILE DAILY DIARY COMPUTER SYSTEM DATA DELIVERY	LS	LUMP SUM	LUMP SUM	
2	030628	TRANSPORTATION FOR THE ENGINEER	LS	LUMP SUM	LUMP SUM	
3	030629	CONSTRUCTION SURVEYING	LS	LUMP SUM	LUMP SUM	
4	030630	PILE CORROSION MONITORING SYSTEM	LS	LUMP SUM	LUMP SUM	
5	070012	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	LUMP SUM	LUMP SUM	
6	070018	TIME-RELATED OVERHEAD	LS	LUMP SUM	LUMP SUM	
7	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM	LUMP SUM	
8	074020	WATER POLLUTION CONTROL	LS	LUMP SUM	LUMP SUM	
9	030631	NON-STORM WATER DISCHARGES	LS	LUMP SUM	LUMP SUM	
10	030632	TURBIDITY CONTROL	LS	LUMP SUM	LUMP SUM	
11	074032	TEMPORARY CONCRETE WASHOUT FACILITY	LS	LUMP SUM	LUMP SUM	
12 (S)	490672	2.5 M CAST-IN-DRILLED-HOLE CONCRETE PILING	M	423		
13 (S)	049245	2.2 M CAST-IN-DRILLED-HOLE CONCRETE PILING (ROCK SOCKET)	M	390		
14 (S)	049246	FURNISH 2.5 M CAST-IN-STEEL SHELL CONCRETE PILING	M	1694		
15 (S)	049247	DRIVE 2.5 M CAST-IN-STEEL SHELL CONCRETE PILE	EA	16		
16 (S)	049248	2.5 M PERMANENT STEEL CASING	M	423		
17 (S-F)	049249	MARINE PILE DRIVING ENERGY ATTENUATOR	LS	LUMP SUM	LUMP SUM	
18 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	M3	7030		
19 (F)	049250	STRUCTURAL CONCRETE, BRIDGE FOOTING (LIGHTWEIGHT)	M3	2300		
20 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	M3	1640		

ENGINEER'S ESTIMATE
04-0120E4

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
21	049251	NONSHRINK GROUT	LS	LUMP SUM	LUMP SUM	
22	049252	NONSHRINK FIBER-REINFORCED GROUT	LS	LUMP SUM	LUMP SUM	
23 (S-F)	520102	BAR REINFORCING STEEL (BRIDGE)	KG	2 495 000		
24 (S-F)	520110	BAR REINFORCING STEEL (EPOXY COATED) (BRIDGE)	KG	801 000		
25 (S-F)	520120	HEADED BAR REINFORCEMENT	EA	3020		
26 (F)	550203	FURNISH STRUCTURAL STEEL (BRIDGE)	KG	3 960 000		
27 (F)	550204	ERECT STRUCTURAL STEEL (BRIDGE)	KG	3 960 000		
28 (S)	590115	CLEAN AND PAINT STRUCTURAL STEEL	LS	LUMP SUM	LUMP SUM	
29 (S)	049253	FURNISH AND INSTALL STEEL DOWNHOLE CASING E	LS	LUMP SUM	LUMP SUM	
30 (S-F)	750501	MISCELLANEOUS METAL (BRIDGE)	KG	8380		
31	800391	CHAIN LINK FENCE (TYPE CL-1.8)	M	150		
32	833080	CONCRETE BARRIER (TYPE K)	M	72		
33	030633	GROUNDING FOR PIERS E2 AND T1 FOUNDATIONS	LS	LUMP SUM	LUMP SUM	
34	030634	NAVIGATION LIGHTING SYSTEM	LS	LUMP SUM	LUMP SUM	
35	030635	STRONG MOTION DETECTION DOWNHOLE	LS	LUMP SUM	LUMP SUM	
36	BLANK					
37 (S-F)	030965	PLASTIC LUMBER	M3	145		
38 (S-F)	030966	UHMW POLYETHYLENE PANEL (50 MM)	M2	930		
39	999990	MOBILIZATION	LS	LUMP SUM	LUMP SUM	

TOTAL BID (A) :

TOTAL BID (B):

\$200,000.00

x

(Cost Per Day)

(Enter Working Days Bid)

(Not To Exceed 390 Days)

**TOTAL BASIS FOR COMPARISON
OF BIDS:**

(A + B):
